

Claim Amendments

This listing of claims will replace all prior versions, and listings, of claims in the application.

Listing of Claims

Claim 1. (Currently Amended) A process for preparing a coating fluid containing a polysiloxane, which comprises:

forming a reaction mixture comprising a silicon compound (A) of ~~the~~ formula (1):



wherein R is a C₁₋₅ alkyl group,

a silicon compound (B) of ~~the~~ formula (2):



wherein R¹ is a C₁₋₅ alkyl group, and n is an integer of from 0 to 12,

a silicon compound (C) of ~~the~~ formula (3):



wherein R² is a C₁₋₅ alkyl group, and m is an integer of from 1 to 5,

an alcohol (D) of ~~the~~ formula (4):



wherein R³ is a hydrogen atom or a C₁₋₁₂ alkyl group, wherein the alkyl group is optionally substituted by one or more substituents of the same or different types selected from the group consisting of a C₁₋₃ alkyl group, a C₁₋₃ hydroxyalkyl group, a C₂₋₆ alkoxyalkyl group, a C₂₋₆ hydroxyalkoxyalkyl group and a C₃₋₆ alkoxyalkoxyalkyl group, and

oxalic acid (E), wherein

(i) ~~the in a ratio of from 0.05 to 0.43 mol of the silicon compound (B) per mol of the silicon compound (A)~~ ranges from 0.05 to 0.43, in a

- (ii) the ratio of from 0.01 to 0.20 mol of the silicon compound (C) per mol of the silicon compound (A) ranges from 0.01 to 0.20 mol, in a
- (iii) the ratio of from 0.5 to 100 mol of the alcohol (D) per mol of the total alkoxy groups contained in the silicon compounds (A), (B) and (C) ranges from 0.5 to 100 mol and in a
- (iv) the ratio of 0.2 to 2 mol of the oxalic acid (E) per mol of the total alkoxy groups contained in the silicon compounds (A), (B) and (C) ranges from 0.2 to 2 mol, and

heating this reaction mixture at a temperature of ranging from 40 to 180° C until the total amount of the silicon compounds (A), (B) and (C) remaining in the reaction mixture ~~becomes~~ reaches at most 5 mol %, while maintaining at a SiO₂ concentration of ranging from 0.5 to 10 wt % as calculated from silicon atoms in the reaction mixture and in the absence of water.

Claim 2. (Original) The process for preparing a coating fluid according to Claim 1, wherein in the formation of the reaction mixture, in addition to the silicon compounds (A), (B) and (C), the alcohol (D) and the oxalic acid (E), at least one alkylalkoxysilane selected from the group consisting of methyltrimethoxysilane, methyltriethoxysilane, ethyltrimethoxysilane, ethyltriethoxysilane, propyltrimethoxysilane, propyltriethoxysilane, butyltrimethoxysilane, butyltriethoxysilane, pentyltrimethoxysilane, pentyltriethoxysilane, heptyltrimethoxysilane, heptyltriethoxysilane, octyltrimethoxysilane, octyltriethoxysilane, dodecyltrimethoxysilane, dodecyltriethoxysilane, hexadecyltrimethoxysilane, hexadecyltriethoxysilane, octadecyltrimethoxysilane, octadecyltriethoxysilane, phenyltrimethoxysilane, phenyltriethoxysilane, vinyltrimethoxysilane, vinyltriethoxysilane, γ -aminopropyltrimethoxysilane, γ -aminopropyltriethoxysilane, γ -

glycidoxypropyltrimethoxysilane, γ -glycidoxypropyltriethoxysilane, γ -methacryloxypropyltrimethoxysilane, γ -methacryloxypropyltriethoxysilane, dimethyldimethoxysilane and dimethyldiethoxysilane, is incorporated as a modifier (F) in a ratio of ranging from 0.02 to 0.2 mol per mol of the silicon compound (A).

Claim 3. (Currently Amended) The process for preparing a coating fluid according to Claim 1, wherein at least one sol selected from the group consisting of silica sol, alumina sol, titania sol, zirconia sol, magnesium fluoride sol and ceria sol is incorporated as an additive (G) to the coating fluid.

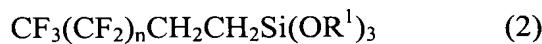
Claim 4. (Currently Amended) A process for forming a coating film, which comprises:

forming a reaction mixture comprising a silicon compound (A) of the formula (1):



wherein R is a C₁₋₅ alkyl group,

a silicon compound (B) of the formula (2):



wherein R¹ is a C₁₋₅ alkyl group, and n is an integer of from 0 to 12,

a silicon compound (C) of the formula (3):



wherein R² is a C₁₋₅ alkyl group, and m is an integer of ranging from 1 to 5,

an alcohol (D) of the formula (4):



wherein R³ is a hydrogen atom or a C₁₋₁₂ alkyl group, wherein the alkyl group is optionally substituted by one or more substituents of the same or different types selected from the group

consisting of a C₁₋₃ alkyl group, a C₁₋₃ hydroxyalkyl group, a C₂₋₆ alkoxyalkyl group, a C₂₋₆ hydroxyalkoxyalkyl group and a C₃₋₆ alkoxyalkoxyalkyl group, and

oxalic acid (E), wherein

- (i) ~~in a the ratio of from 0.05 to 0.43 mol of the silicon compound (B) per mol of the silicon compound (A)~~ ranges from 0.05 to 0.43 mol, in a
- (ii) ~~the ratio of from 0.01 to 0.20 mol of the silicon compound (C) per mol of the silicon compound (A)~~ ranges from 0.01 to 0.20 mol, in a
- (iii) ~~the ratio of from 0.5 to 100 mol of the alcohol (D) per mol of the total alkoxy groups contained present in the silicon compounds (A), (B) and (C)~~ ranges from 0.5 to 100 mol, and
- (iv) ~~in a the ratio of 0.2 to 2 mol of the oxalic acid (E) per mol of the total alkoxy groups contained present in the silicon compounds (A), (B) and (C)~~ ranges from 0.2 to 2 mol;

heating this reaction mixture at a temperature of ranging from 40 to 180° C until the total amount of the silicon compounds (A), (B) and (C) remaining in the reaction mixture becomes at most 5 mol %, while maintaining at a SiO₂ concentration of from 0.5 to 10 wt% as calculated from silicon atoms in the reaction mixture and in the absence of water, and forming a solution of a polysiloxane; then

applying a coating fluid comprising the polysiloxane solution on a substrate surface to form a coating; and

heat-curing the coating at a temperature of from 40 to 450° C, to form a coating film having a refractive index of from 1.28 to 1.41 and a contact angle with water of ranging from 90° to 115°, as adhered to the substrate surface.

Claim 5. (Original) The process for forming a coating film according to Claim 4, wherein in the formation of the reaction mixture, in addition to the silicon compounds (A), (B) and (C), the alcohol (D) and the oxalic acid (E), at least one alkylalkoxysilane selected from the group consisting of methyltrimethoxysilane, methyltriethoxysilane, ethyltrimethoxysilane, ethyltriethoxysilane, propyltrimethoxysilane, propyltriethoxysilane, butyltrimethoxysilane, butyltriethoxysilane, pentyltrimethoxysilane, pentyltriethoxysilane, heptyltrimethoxysilane, heptyltriethoxysilane, octyltrimethoxysilane, octyltriethoxysilane, dodecyltrimethoxysilane, dodecyltriethoxysilane, hexadecyltrimethoxysilane, hexadecyltriethoxysilane, octadecyltrimethoxysilane, octadecyltriethoxysilane, phenyltrimethoxysilane, phenyltriethoxysilane, vinyltrimethoxysilane, vinyltriethoxysilane, γ -aminopropyltrimethoxysilane, γ -aminopropyltriethoxysilane, γ -glycidoxypropyltrimethoxysilane, γ -glycidoxypropyltriethoxysilane, γ -methacryloxypropyltrimethoxysilane, γ -methacryloxypropyltriethoxysilane, dimethyldimethoxysilane and dimethyldiethoxysilane, is incorporated as a modifier (F) in a ratio of from 0.02 to 0.2 mol per mol of the silicon compound (A).

Claim 6. (Currently Amended) The process for forming a coating film according to Claim 4, wherein at least one sol selected from the group consisting of silica sol, alumina sol, titania sol, zirconia sol, magnesium fluoride sol and ceria sol is ~~further~~ incorporated as an additive (G) to the coating fluid.

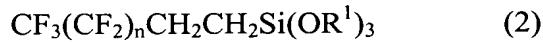
Claim 7. (Currently Amended) A coating film having a refractive index ~~of~~ ranging from 1.28 to 1.41 and a contact angle with water ~~of~~ ranging from 90° to 115°, which is formed as adhered to a substrate surface by

forming a reaction mixture comprising a silicon compound (A) of ~~the~~ formula (1):



wherein R is a C₁₋₅ alkyl group,

a silicon compound (B) of the formula (2):



wherein R¹ is a C₁₋₅ alkyl group, and n is an integer of from 0 to 12,

a silicon compound (C) of the formula (3):



wherein R² is a C₁₋₅ alkyl group, and m is an integer of ~~ranging~~ from 1 to 5,

an alcohol (D) of the formula (4):



wherein R³ is a hydrogen atom or a C₁₋₁₂ alkyl group, wherein the alkyl group is optionally substituted by one or more substituents of the same or different types selected from the group consisting of a C₁₋₃ alkyl group, a C₁₋₃ hydroxyalkyl group, a C₂₋₆ alkoxyalkyl group, a C₂₋₆ hydroxyalkoxyalkyl group and a C₃₋₆ alkoxyalkoxyalkyl group), and

oxalic acid (E), wherein in a

(i) the ratio of from 0.05 to 0.43 mol of the silicon compound (B) per mol of the silicon compound (A) ranges from 0.05 to 0.43 mol, in a

(ii) the ratio of from 0.01 to 0.20 mol of the silicon compound (C) per mol of the silicon compound (A) ranges from 0.01 to 0.20 mol, in a

(iii) the ratio of from 0.5 to 100 mol of the alcohol (D) per mol of the total alkoxy groups contained present in the silicon compounds (A), (B) and (C) ranges from 0.5 to 100 mol and in a the ratio of 0.2 to 2 mol of the oxalic acid (E) per mol of the total alkoxy groups contained in the silicon compounds (A), (B) and (C) ranges from of 0.2 to 2 mol;

heating the reaction mixture at a temperature of ~~ranging~~ from 40 to 180° C until the total amount of the silicon compounds (A), (B) and (C) remaining in the reaction mixture

~~becomes reaches~~ at most 5 mol %, while maintaining at a SiO₂ concentration of ranging from 0.5 to 10 wt_w as calculated from silicon atoms in the reaction mixture and while in the absence of water and forming a solution of a polysiloxane; and

applying a coating fluid comprising the polysiloxane solution on a substrate surface to form a coating; and

heat-curing the coating at a temperature of ranging from 40 to 450° C.

Claim 8. (Currently Amended) The coating film according to Claim 7, wherein in the formation of the reaction mixture, in addition to the silicon compounds (A), (B) and (C), the alcohol (D) and the oxalic acid (E), at least one alkylalkoxysilane selected from the group consisting of methyltrimethoxysilane, methyltriethoxysilane, ethyltrimethoxysilane, ethyltriethoxysilane, propyltrimethoxysilane, propyltriethoxysilane, butyltrimethoxysilane, butyltriethoxysilane, pentyltrimethoxysilane, pentyltriethoxysilane, heptyltrimethoxysilane, heptyltriethoxysilane, octyltrimethoxysilane, octyltriethoxysilane, dodecyltrimethoxysilane, dodecyltriethoxysilane, hexadecyltrimethoxysilane, hexadecyltriethoxysilane, octadecyltrimethoxysilane, octadecyltriethoxysilane, phenyltrimethoxysilane, phenyltriethoxysilane, vinyltrimethoxysilane, vinyltriethoxysilane, γ -aminopropyltrimethoxysilane, γ -aminopropyltriethoxysilane, γ -glycidoxypropyltrimethoxysilane, γ -glycidoxypropyltriethoxysilane, γ -methacryloxypropyltrimethoxysilane, γ -methacryloxypropyltriethoxysilane, dimethyldimethoxysilane and dimethyldiethoxysilane, is incorporated as a modifier (F) in a ratio of ranging from 0.02 to 0.2 mol per mol of the silicon compound (A).

Claim 9. (Previously Presented) The coating film according to Claim 7, wherein at least one sol selected from the group consisting of silica sol, alumina sol, titania sol, zirconia

sol, magnesium fluoride sol and ceria sol is incorporated as an additive (G) to the coating fluid.

Claim 10. (Currently Amended) A process for forming a coating film, which comprises:

forming a reaction mixture comprising a silicon compound (A) of the formula (1):



wherein R is a C₁₋₅ alkyl group,

a silicon compound (B) of the formula (2):



wherein R¹ is a C₁₋₅ alkyl group, and n is an integer of ranging from 0 to 12,

a silicon compound (C) of the formula (3):



wherein R² is a C₁₋₅ alkyl group, and m is an integer of ranging from 1 to 5,

an alcohol (D) of the formula (4):



wherein R³ is a hydrogen atom or a C₁₋₁₂ alkyl group, wherein the alkyl group is optionally substituted by one or more substituents of the same or different types selected from the group consisting of a C₁₋₃ alkyl group, a C₁₋₃ hydroxyalkyl group, a C₂₋₆ alkoxyalkyl group, a C₂₋₆ hydroxyalkoxyalkyl group and a C₃₋₆ alkoxyalkoxyalkyl group), and

oxalic acid (E), wherein

(i) ~~in a the ratio of from 0.05 to 0.43 mol~~ of the silicon compound (B) per mol of the silicon compound (A) ranges from 0.05 to 0.43 mol,

(ii) ~~in a the ratio of from 0.01 to 0.20 mol~~ of the silicon compound (C) per mol of the silicon compound (A) ranges from 0.01 to 0.20 mol,

(iii) in a ~~the ratio of from 0.5 to 100 mol~~ of the alcohol (D) per mol of the total alkoxy groups contained in the silicon compounds (A), (B) and (C) ranges from 0.5 to 100 mol, and

(iv) in a ~~the ratio of 0.2 to 2 mol~~ of the oxalic acid (E) per mol of the total alkoxy groups contained in the silicon compounds (A), (B) and (C) ranges from 0.2 to 2 mol;

heating the reaction mixture at a temperature of ranging from 40 to 180° C until the total amount of the silicon compounds (A), (B) and (C) remaining in the reaction mixture ~~becomes reaches~~ at most 5 mol %, while maintaining a SiO₂ concentration of ranging from 0.5 to 10 wt % as calculated from silicon atoms in the reaction mixture and in the absence of water forming a solution of a polysiloxane; and

applying a coating fluid comprising the polysiloxane solution on a substrate surface to form a coating;

drying the coating at a temperature of ranging from 40 to 150° C, and

aging the coating at a temperature of from 20 to 100°C for curing, to form a coating film having a refractive index of from 1.28 to 1.41 and a contact angle with water of ranging from 90° to 115°, as adhered to the substrate surface.

Claim 11. (Original) The process for forming a coating film according to Claim 10, wherein in the formation of the reaction mixture, in addition to the silicon compounds (A), (B) and (C), the alcohol (D) and the oxalic acid (E), at least one alkylalkoxysilane selected from the group consisting of methyltrimethoxysilane, methyltriethoxysilane, ethyltrimethoxysilane, ethyltriethoxysilane, propyltrimethoxysilane, propyltriethoxysilane, butyltrimethoxysilane, butyltriethoxysilane, pentyltrimethoxysilane, pentyltriethoxysilane, heptyltrimethoxysilane, heptyltriethoxysilane, octyltrimethoxysilane, octyltriethoxysilane, dodecyltrimethoxysilane, dodecyltriethoxysilane, hexadecyltrimethoxysilane,

hexadecyltriethoxysilane, octadecyltrimethoxysilane, octadecyltriethoxysilane,
phenyltrimethoxysilane, phenyltriethoxysilane, vinyltrimethoxysilane, vinyltriethoxysilane,
 γ -aminopropyltrimethoxysilane, γ -aminopropyltriethoxysilane, γ -
glycidoxypropyltrimethoxysilane, γ -glycidoxypropyltriethoxysilane, γ -
methacryloxypropyltrimethoxysilane, γ -methacryloxypropyltriethoxysilane,
dimethyldimethoxysilane and dimethyldiethoxysilane, is incorporated as a modifier (F) in a
ratio of from 0.02 to 0.2 mol per mol of the silicon compound (A).

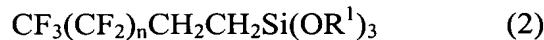
Claim 12. (Previously Presented) The process for forming a coating film according to
Claim 10, wherein at least one sol selected from the group consisting of silica sol, alumina
sol, titania sol, zirconia sol, magnesium fluoride sol and ceria sol is incorporated as an
additive (G) to the coating fluid.

Claim 13. (Currently Amended) A coating film having a refractive index of ranging
from 1.28 to 1.41 and a contact angle with water of ranging from 90° to 115°, which is
formed as adhered to a substrate surface by forming a reaction mixture comprising
a silicon compound (A) of ~~the~~ formula (1):



wherein R is a C₁₋₅ alkyl group,

a silicon compound (B) of ~~the~~ formula (2):



wherein R¹ is a C₁₋₅ alkyl group, and n is an integer of from 0 to 12,

a silicon compound (C) of ~~the~~ formula (3):



wherein R² is a C₁₋₅ alkyl group, and m is an integer of from 1 to 5,

an alcohol (D) of the formula (4):



wherein R^3 is a hydrogen atom or a C_{1-12} alkyl group, wherein the alkyl group may optionally be substituted by one or more substituents of the same or different types selected from the group consisting of a C_{1-3} alkyl group, a C_{1-3} hydroxyalkyl group, a C_{2-6} alkoxyalkyl group, a C_{2-6} hydroxyalkoxyalkyl group and a C_{3-6} alkoxyalkoxyalkyl group), and

oxalic acid (E), wherein in a

(i) ~~the ratio of from 0.05 to 0.43~~ of the silicon compound (B) per mol of the silicon compound (A) ranges from 0.05 to 0.43 mol,

(ii) ~~in a the ratio of from 0.01 to 0.20 mol~~ of the silicon compound (C) per mol of the silicon compound (A) ranges from 0.01 to 0.20 mol,

(iii) ~~in a the ratio of from 0.5 to 100 mol~~ of the alcohol (D) per mol of the total alkoxy groups ~~contained~~ present in the silicon compounds (A), (B) and (C) ranges from 0.5 to 100 mol, and

(iv) ~~in a the ratio of 0.2 to 2 mol~~ of the oxalic acid (E) per mol of the total alkoxy groups contained in the silicon compounds (A), (B) and (C) ranges from 0.2 to 2 mol;

heating ~~this~~ the reaction mixture at a temperature of ranging from 40 to 180° C until the total amount of the silicon compounds (A), (B) and (C) remaining in the reaction mixture ~~becomes reaches~~ at most 5 mol %, while ~~it is maintained at~~ maintaining a SiO_2 concentration of ranging from 0.5 to 10 wt % as calculated from silicon atoms in the reaction mixture and in the absence of water forming a solution of a polysiloxane;

applying a coating fluid comprising the polysiloxane solution on a substrate surface to form a coating;

drying the coating at a temperature ~~of~~ ranging from 40 to 150° C and aging the coating at a temperature ~~of~~ ranging from 20 to 100° C for curing.

Claim 14. (Original) The coating film according to Claim 13, wherein in the formation of the reaction mixture, in addition to the silicon compounds (A), (B) and (C), the alcohol (D) and the oxalic acid (E), at least one alkylalkoxysilane selected from the group consisting of methyltrimethoxysilane, methyltriethoxysilane, ethyltrimethoxysilane, ethyltriethoxysilane, propyltrimethoxysilane, propyltriethoxysilane, butyltrimethoxysilane, butyltriethoxysilane, pentyltrimethoxysilane, pentyltriethoxysilane, heptyltrimethoxysilane, heptyltriethoxysilane, octyltrimethoxysilane, octyltriethoxysilane, dodecyltrimethoxysilane, dodecyltriethoxysilane, hexadecyltrimethoxysilane, hexadecyltriethoxysilane, octadecyltrimethoxysilane, octadecyltriethoxysilane, phenyltrimethoxysilane, phenyltriethoxysilane, vinyltrimethoxysilane, vinyltriethoxysilane, γ -aminopropyltrimethoxysilane, γ -aminopropyltriethoxysilane, γ -glycidoxypropyltrimethoxysilane, γ -glycidoxypropyltriethoxysilane, γ -methacryloxypropyltrimethoxysilane, γ -methacryloxypropyltriethoxysilane, dimethyldimethoxysilane and dimethyldiethoxysilane, is incorporated as a modifier (F) in a ratio ~~of~~ ranging from 0.02 to 0.2 mol per mol of the silicon compound (A).

Claim 15. (Previously Presented) The coating film according to Claim 13, wherein at least one sol selected from the group consisting of silica sol, alumina sol, titania sol, zirconia sol, magnesium fluoride sol and ceria sol is incorporated as an additive (G) to the coating fluid.